

Claim Status

1. (Currently Amended) Apparatus for sensing the level of fluid within a container comprising:
 - a) a base fixed within the container;
 - b) a movable member supported by the base for relative positioning with respect to said base;
 - c) a float member that moves relative to the base as the level of fluid in a container changes;
 - d) an arm attached to the movable member and float member wherein the position of the float is translated into movement of the moveable member with respect to said base;
 - e) at least one magnetic flux sensor that is housed within a cavity containing encapsulant within the base located within said container and is coupled to one of the moveable member or base for creating an electrical output signal in response to a change in magnetic flux density; and
 - f) at least one magnet disposed proximate the magnetic flux sensor coupled to one of the moveable member or base for providing a magnetic field to induce a change in electrical output response from the magnetic flux sensor as the float member moves with changes in fluid level.
2. (Original) A fluid level sensor according to claim 1 wherein the at least one magnetic flux sensor element comprises a programmable linear ratiometric Hall effect integrated circuit having programmable gain, offset voltage and temperature compensation.
3. (Original) A fluid level sensor according to claim 1 wherein the magnetic field is provided using a permanent magnet.

4. (Cancelled)

5. (Original) A fluid level sensor according to claim 1 wherein the magnetic flux sensor remains stationary while the magnetic field changes position relative to the magnetic flux sensor.

Please cancel withdrawn claim 6 without prejudice or disclaimer.

6. (Cancelled)

7. (previously presented) A fluid level sensor according to claim 1 wherein the float member and arm are attached to the movable member.

8. (Original) A fluid level sensor according to claim 1 wherein the base has an integral mounting feature so that the fluid level sensor can be mounted to and positively located on a fuel pump module, other fuel system mounting feature or other mounting feature within a fluid container.

9. (Original) A fluid level sensor according to claim 1 wherein the base or movable member has integral features for positively positioning the magnetic flux sensor.

Please cancel withdrawn claims 10 and 11 without prejudice or disclaimer

10 and 11. (Cancelled)

12. (Original) A fluid level sensor according to claim 1 wherein the base has an integral electrical connector block for making electrical connections to the sensor electronics.

Please cancel claim 13 without prejudice or disclaimer and add subject matter to claim 1.

13. (cancelled)

14. (previously presented) A fluid level sensor according to claim 1 wherein the base has a first travel stop to prevent the arm from exceeding maximum upward travel and a second travel stop to prevent the arm from exceeding maximum downward travel.

Please cancel claim 15 without prejudice or disclaimer and re-write as new claim 43.

15. (Cancelled)

16. (currently amended) A fluid level sensor according to claim ~~15~~ 43 wherein said encapsulant protects the electronics by dampening mechanical vibration and shock.

17. (currently amended) A fluid level sensor according to claim ~~15~~ 43 wherein said encapsulant maintains positive positioning of the magnetic flux sensor.

Please cancel withdrawn claims 18 – 20 without prejudice or disclaimer

18 - 20. (cancelled)

21. (previously presented) A fluid level sensor according to claim 42 wherein said lead frame is made up of a number of leads that provide additional mechanical support and protection for the magnetic flux sensor.

22. (Cancelled)

23. (previously presented) A fluid level sensor according to claim 42 where the lead frame that provides electrical terminals that complete an integrated electrical connector forming part of the pivot base.

24. (previously presented) A fluid level sensor according to claim 42 wherein the lead frame provides an electrical path to other circuitry.

Please cancel claim 25 and re-write as new claim 44

25. (Cancelled)

Please cancel withdrawn claims 26 and 27 without prejudice or disclaimer.

26 and 27. (Cancelled)

28. (Original) A fluid level sensor according to claim 1 wherein the float arm comprises a yoke that attaches symmetrically to the float to reduce cantilevering in the float arm.

29. (Original) A fluid level sensor according to claim 1 wherein a pivoting float maintains similar orientation to the fluid surface throughout the range of float arm travel.

Please cancel withdrawn claim 30 without prejudice or disclaimer.

30. (Cancelled)

31. (Original) A fluid level sensor according to claim 1 wherein a float geometry defines a float thickness that is less than a width dimension of generally flat float top and bottom surfaces to enhance float buoyancy for low fluid level detection.

32. (Original) A fluid level sensor according to claim 31 wherein the float thickness is less than either a width or length dimension of a generally rectangular float top and bottom surfaces to enhance float buoyancy for low fluid level detection.

33. (Currently Amended) A method for fabricating a sensor for sensing the level of fluid within a container comprising:

- a) fixing a base within the container;
- b) coupling a movable member to the base for relative positioning with respect to said base;
- c) providing a float member that moves up and down with the level of fluid in a container changes;
- d) attaching the float member to the moveable member by means of an arm attached to the moveable member and float member wherein the position of the float is translated into movement of the moveable member with respect to said base;
- e) positioning a magnetic flux sensor within the chamber by coupling said magnetic flux sensor to one of the moveable member or base to create an electrical output signal in response to a change in magnetic flux density; and
- f) positioning at least one magnet disposed proximate the magnetic flux sensor coupled to one of the moveable member or base for providing a magnetic field to induce a change in electrical output response from the magnetic flux sensor as the float member moves up and down with changes in fluid level ; and
- g) providing an encapsulant for isolating the magnetic flux sensor from harsh fluids found in liquid fuels.

Please cancel claim 34 without prejudice or disclaimer and combine with claim 33.

34. (Cancelled)

Please cancel claim 35 and re-write as new claim 45

35. (Cancelled)

36. (Original) The method of claim 33 wherein said encapsulant maintains positive positioning of the magnetic flux sensor.

Please cancel withdrawn claims 37 – 41

37 – 41 (Cancelled)

42. (previously presented) Apparatus for sensing the level of fluid within a container comprising:

- a) a base fixed relative to the container;
- b) a movable member supported by the base for relative positioning with respect to said base;
- c) a float member that moves relative to the base as the level of fluid in a container changes;
- d) an arm attached to the movable member and float member wherein the position of the float is translated into movement of the moveable member with respect to said base;
- e) a sensor assembly having at least one magnetic flux sensor coupled to one of the moveable member or base for creating an electrical output signal in response to a change in magnetic flux density and a lead frame that helps to locate the magnetic flux sensor with respect to the moveable member or base; and
- f) at least one magnet disposed proximate the magnetic flux sensor coupled to one of the moveable member or base for providing a magnetic field to

induce a change in electrical output response from the magnetic flux sensor as the float member moves with changes in fluid level.

Please add new claim 43 which corresponds to previously pending claim 15.

43. (new) Apparatus for sensing the level of fluid within a container comprising:
- a) a base fixed within the container;
 - b) a movable member supported by the base for relative positioning with respect to said base;
 - c) a float member that moves relative to the base as the level of fluid in a container changes;
 - d) an arm attached to the movable member and float member wherein the position of the float is translated into movement of the moveable member with respect to said base;
 - e) at least one magnetic flux sensor that is located within said container and is coupled to one of the moveable member or base for creating an electrical output signal in response to a change in magnetic flux density; and
 - f) at least one magnet disposed proximate the magnetic flux sensor coupled to one of the moveable member or base for providing a magnetic field to induce a change in electrical output response from the magnetic flux sensor as the float member moves with changes in fluid level;
 - g) said base comprising an encapsulant for isolating the flux sensor from harsh fluids found in liquid fuels.

Please add new claim 44 which corresponds to cancelled claim 25

44. (new) Apparatus for sensing the level of fluid within a container comprising:
- a) a base fixed within the container;

- b) a movable member supported by the base for relative positioning with respect to said base;
- c) a float member that moves relative to the base as the level of fluid in a container changes;
- d) an arm attached to the movable member and float member wherein the position of the float is translated into movement of the moveable member with respect to said base;
- e) at least one magnetic flux sensor that is located within said container and is coupled to one of the moveable member or base for creating an electrical output signal in response to a change in magnetic flux density; and
- f) at least one magnet disposed proximate the magnetic flux sensor coupled to one of the moveable member or base for providing a magnetic field to induce a change in electrical output response from the magnetic flux sensor as the float member moves with changes in fluid level;
- g) said moveable member comprising a magnet hub that has at least one integral axial spring member that positions the magnet toward the magnet hub center axis.

Please add new claim 45 based on cancelled claim 35.

45. (new) A method for fabricating a sensor for sensing the level of fluid within a container comprising:

- a) fixing a base within the container;
- b) coupling a movable member to the base for relative positioning with respect to said base;
- c) providing a float member that moves up and down with the level of fluid in a container changes;
- d) attaching the float member to the moveable member by means of an arm attached to the moveable member and float member wherein the position

- of the float is translated into movement of the moveable member with respect to said base;
- e) positioning a magnetic flux sensor within the chamber by coupling said magnetic flux sensor to one of the moveable member or base to create an electrical output signal in response to a change in magnetic flux density;
 - f) positioning at least one magnet disposed proximate the magnetic flux sensor coupled to one of the moveable member or base for providing a magnetic field to induce a change in electrical output response from the magnetic flux sensor as the float member moves up and down with changes in fluid level; and
 - g) providing an encapsulant that protects the magnetic flux sensor by dampening mechanical vibration and shock